Benefit transfers as a field experiment in Poland – the case of forest use values

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Four On-site Surveys Selected for Benefit Transfer Tests

Forest ID	Adjacent city	Inhabitants ('000s)	Unemployment rate	Avg. monthly household income (EUR)
1	Lublin	352	5%	691
2	Radom	225	12%	640
3	Szczecin	408	3.5%	744
4	Zielona Gora	118	2.7%	692

Forest ID	Conservation regime	Type of forest	Dominant species	Forest cover in region
1	Landscape Park	mixed broadleaved	pine, sessile oak	14%
2	Landscape Park & Promotional Area	mixed broadleaved	pine, sessile oak, oak	25%
3	Landscape Park & Promotional Area	broadleaved	beech, alder, hornbeam	32%
4	None	coniferous, broadleaved	pine, ash alder	49%

Combined Survey Design & Data

Identical sampling of the four sites

- 1345 persons approached; 11% opted out or resigned
- 1128 interviews in total.
- Polled along main paths, picnic areas and parking places; randomly 7 days a week during day time;

TCM/CVM combined design

- Individual TCM with observed and reported seasonal number of visits aims at estimating recreational value per visit and forest visitation patterns
- CVM focuses on valuing biodiversity and aesthetic aspects of the forests through two forest management programmes
- Sample retained for TCM analysis excludes multi-destination trips and comprises day-trips only (744 respondents)

Summary Statistics of visits to four sites

Forest	Lublin	Radom	Szczecin	Zielona Gora	All forests
Variable	Mean (std.)				
One-way distance (km)	18 (12)	7 (10)	18 (18)	13 (19)	14 (15)
One-way travel time (mn)	27 (14)	17 (16)	31 (26)	29 (27)	25 (22)
Time spent on site (mn)	112 (57)	105 (67)	115 (81)	94 (50)	108 (67)
TRAVEL MODE (main)					
- car	0.91	0.64	0.78	0.71	0.76
- bike	0.1	0.19	0.08	0.08	0.12
- public transport	0.03	0.02	0.14	0.1	0.06
PURPOSE OF TRIP (main)					
- Walking	0.48	0.61	0.63	0.59	0.58
- Watching nature	0.14	0.19	0.28	0.29	0.22
- Picking berries/mushrooms	0.69	0.44	0.31	0.40	0.46

Estimation of Demand for Forest Recreation

- Count data model with a Poisson distribution adjusted for:
  - left truncation at zero;
  - endogenous stratification; and
  - right-truncated distributions.

- Seasonal and annual estimation of demand function;

- Demand system of count models in TCM (incl. seasonal demand):

$$\ln(y_{is}) = \alpha_s - \sum_{j=s}^{4} \beta_s TC_{is} + \gamma_s m_i + \kappa_s x_i ,$$

- Joint Poisson estimation model (incl. seasonal demand):

$$L_P = \sum_{s=1}^{3}\sum_{i=1}^{n}\left[y_{si} \ln(\lambda_{si}) - \ln(y_{si}!) - \ln(\sum_{j=0}^{a} \frac{\lambda_{si}^{j}}{j!}) \right] + \sum_{i=1}^{n}\left[(y_i - 1)\ln(\lambda_i) - \ln((y_i - 1)!) - \ln(\sum_{j=0}^{a} \frac{\lambda_i^{j}}{j!}) \right]$$

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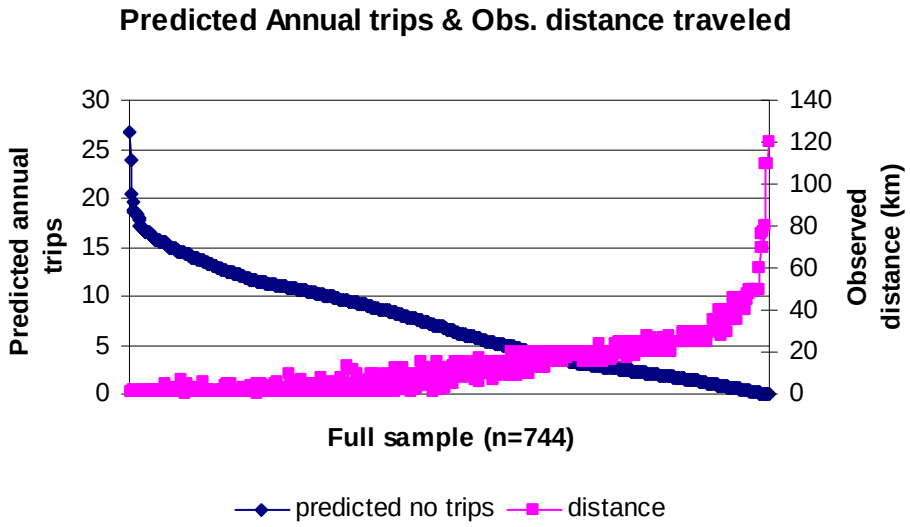
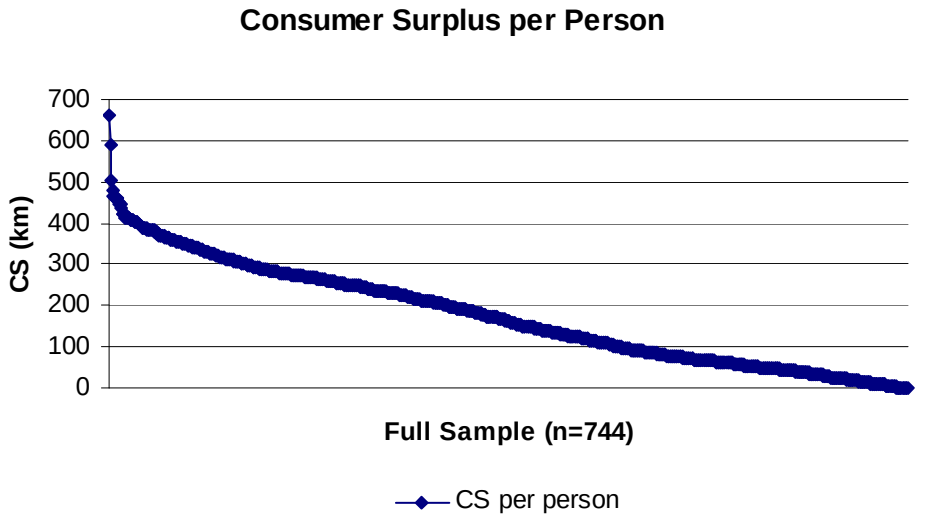
Travel Cost Model Estimation

Variable	*4 Forests*	*Lublin*	*Radom*	*Szczecin*	*Zielona Gora*
Constant	1.9118*** (0.4272)	3.54770** (1.27137)	0.90374 (0.74373)	2.58411* (1.22859)	-2.63507 (4.82297)
2*distance	-0.0405*** (0.0060)	-0.0715** (0.02132)	-0.0435*** (0.00703)	-0.0362** (0.01477)	-0.03615 (0.02775)
Male (1=0)	0.06062 (0.00487)	0.20304 (0.40780)	0.39183 (0.25240)	-0.05945 (0.34297)	-0.24700 (0.55202)
Age	0.00908 (0.1471)	-0.02176 (0.01716)	0.01230* (0.00621)	0.01370 (0.01353)	0.05992 (0.05782)
Income	0.06095 (0.06156)	-0.25732 (0.21557)	-0.07264 (0.13567)	0.14961 (0.21223)	-1.03445 (1.26190)
Years Education	0.03505 (0.02335)	0.05374 (0.05786)	0.05959 (0.05525)	0.04930 (0.082639	0.20668 (0.19405)
Household size	-0.06137 (0.05691)	-0.03474 (0.13214)	0.09336 (0.07235)	-0.42347 (0.23789)	0.44567 (0.56631)
Log Likelihood	-13887.79	-2122.42	-5640.04	-3397.39	-1360.81
Sample size	**744**	**184**	**228**	**203**	**125**

Travel Cost Results

Forest	*Marginal CS (km)*	*Average CS (km)*	*Predicted Lambda*	*Predicted beta (km)*
Lublin	14	86	6.156	-0.072
Radom	23	220	9.542	-0.043
Szczecin	28	287	10.412	-0.036
(Zielona	*28*	*343*	*12.408*	*-0.036)*
All Four forests	**24**	**212**	**8.575**	-0.041





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Unit Value Transfer of marginal CS – 3 forests

- Unit Value transfer of the marginal CS produce errors in the range from -50% to 100%

Transfer Error of unit value transfer		**CS (km) estimated**	**Value transfer to:**		
	4 Forests	24	Lublin	Radom	Szczecin
Value Transfer from:	Lublin	14	-	-39%	-50%
	Radom	23	64%	-	-18%
	Szczecin	28	100%	22%	-
Average transfer errors			82%	-9%	-34%

Updated Value Transfer of Average CS – 3 forests

$$WTPA = \int_{C^0}^{\infty} e^{\beta_0 + \beta_{TC} \cdot C} dC = \left[\frac{e^{\beta_0 + \beta_{TC} \cdot C}}{\beta_{TC}} \right]_{C=C^0}^{C \to \infty} = \frac{\lambda}{\beta_{TC}}$$

1. Value transfer of predicted number of annual trips (λ) from policy site to study site, keeping marginal CS (β_{TC}) of the study site constant
   - Value Transfer from forest A to B : CS_B= - λ(forest A)/ βTC(Forest B)
2. Value transfer of marginal CS (β_{TC}) , keeping the predicted number of annual trips (λ) constant
   - Value Transfer from forest A to B: CS_B = - λ(forest B)/ βTC(Forest A)

Policy site results	Predicted λ	Predicted β_{TC}	Significance level of β_{TC}
Four sites	8.575	-0.041	***
Lublin	6.156	-0.072	**
Radom	9.542	-0.043	***
Szczecin	10.412	-0.036	**

Updated Value Transfer - Results

- Errors of λ transfer range from -41% to 69%
- Errors of βTC transfer range from -49% to 97%

Error of updated value transfer (λ)		**Transfer to:**		
	Forests	Lublin	Radom	Szczecin
Transfer from:	Lublin	-	-35%	-41%
	Radom	55%	-	-8%
	Szczecin	69%	9%	-
Average transfer errors		62%	5%	-4%

Error of updated value transfer (βTC)		**Transfer to:**		
	Forests	Lublin	Radom	Szczecin
Transfer from:	Lublin	-	-39%	-49%
	Radom	65%	-	-17%
	Szczecin	97%	20%	-
Average transfer errors		81%	10%	-8%

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Some Conclusions & Next Steps

Conclusions & Next Steps

Conclusions:

- Updating the value transfer does not necessarily perform better than a single unit transfer;
- Unit value transfer appear to perform better than updating the value function with the marginal utility of income;
- Updating with predicted number of trips provides overall the best transfer results;
- Errors however remain in the best case up to 60%.

Next steps:

- Test of transfer of demand function, keeping population constant;
- Pooled policy site transfers;
- Statistical tests of coefficients and LL ratios;
- Comparison of transfer results between TCM & CVM;

Tak for opmærksomheden!

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